

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 9611

Roll No.

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B.Tech.

(SEMESTER-II) THEORY EXAMINATION, 2011-12

ENGINEERING PHYSICS - II

Time : 2 Hours]

[Total Marks : 50

Note : This question paper contains three Sections – A, B, C. Section – A has one question having five parts. Each part is to be answered in 50-75 words. Section – B has one question having five parts. Only three parts are to be answered, each in 100 – 200 words. Section – C has five questions with internal choice. All questions are to be answered, each in 300 – 500 words.

SECTION – A

1. Attempt all parts of this question. Each part carries 2 marks. 5 × 2 = 10
- What information do you derive about nature of light from Compton effect experiment ?
 - Give the physical significance of wave function ψ in quantum mechanics.
 - Describe the origin of diamagnetism.
 - Discuss various types of polarizations in a dielectric medium.
 - What is Meissner effect ?

SECTION – B

2. Attempt any three parts of this question. Each part carries five marks. 3 × 5 = 15
- Determine the transition temperature and critical field at 4.2 K for a given specimen of a superconductor if the critical fields are 1.410×10^5 and 4.205×10^5 amp/m, at 1.41 K and 12.9 K, respectively.
 - Calculate the uncertainty in velocity of an electron which is confined to a box of length 10^{-10} m. Given $m_e = 9.1 \times 10^{-31}$ Kg. and $h = 6.63 \times 10^{-34}$ J-s.
 - Earth receives solar energy from the Sun which is 10 Joules per minute per cm^2 . What are the amplitude of electric and magnetic fields of radiation ?

- (d) Benzene has static dielectric constant 2.28 while water has 81 at 300 K. Find the polarization when the plates of a capacitor are immersed into these liquids at 300 K in the presence of the electric field of 300 V/cm. $\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$.
- (e) When X-rays of energy 100 KeV strike a target, they are scattered at an angle 30° . Find the energy of recoil electron. $h = 6.63 \times 10^{-34} \text{ J-s}$.

SECTION – C

3. Attempt any **one** part of the following : 1 × 5 = 5
- (a) Write down Schrodinger's wave equation for a particle in one dimensional box and solve it to find out the eigen values and eigen function.
- (b) Derive Bragg's law of X-ray diffraction in crystals. How can one use this law to obtain crystal structure ?
4. Attempt any **one** part of the following : 1 × 5 = 5
- (a) Derive an expression for the electric field strength on a molecule within a dielectric. Hence, obtain Clausius – Mossotti relation.
- (b) Discuss the behaviour of dielectric in a.c. field and derive an expression for the dielectric loss. Draw frequency response curve of dielectric constant and dielectric loss.
5. Attempt any **one** part of the following : 1 × 5 = 5
- (a) Write down Maxwell's equations in a conducting medium and show that electric and magnetic field strength will decrease exponentially with the distance from the surface into the conducting medium.
- (b) Write down Maxwell's equation in integral form and convert them into differential form. Give physical significance of each equation. What correction was made by Maxwell to the Ampere's law ?
6. Attempt any **one** part of the following : 1 × 5 = 5
- (a) What do you mean by superconductivity ? Describe the effect of the following on the superconducting properties.
- (i) Magnetic field
- (ii) Temperature
- (iii) Isotopes
- (b) What are Type I and Type II superconductors ? Describe, in brief, BCS theory of superconductivity.

7. Attempt any **one** part of the following :

1 × 5 = 5

- (a) Give Langevin's theory of paramagnetism. How does it account the main characteristic of the paramagnetic materials ?
 - (b) What do you mean by magnetic hysteresis ? Explain this effect and draw typical hysteresis curves suitable for transformer core and permanent magnet.
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